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Launch Services Division Safety

# Launch Services Safety Overview

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4 March 2008



# **Safety Roles & Responsibilities**

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## **NASA/KSC Launch Services Division Safety (SA-D) services include...**

- **Assessing the safety of the launch vehicle**
- **Assessing the safety of NASA ELV spacecraft (S/C) / launch vehicle (LV) interfaces**
- **Assessing the safety of spacecraft processing to ensure resource protection of:**
  - **KSC facilities**
  - **KSC VAFB facilities**
  - **KSC controlled property**
  - **Other NASA assets**
- **NASA personnel safety**
- **Interfacing with payload organizations to review spacecraft for adequate safety implementation and compliance for integrated activities**
- **Assisting in the integration of safety activities between the payload, launch vehicle, and processing facilities**

**All organizations are responsible for the safety of their personnel in all facilities**



# KSC Safety Activities

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## Safety Activities are defined by:

- NASA-STD-8709.2 – *NASA Safety and Mission Assurance Roles and Responsibilities for Expendable Launch Vehicles*
- NPD 8610.23 – *Launch Vehicle Technical Oversight Policy*
- NASA-STD-8719.8 – *ELV Payload Safety Review Process Standard*
  - NPR 8715.XX - *ELV Payload Safety Program to replace 8719.8*
- NPD 8700.3 – *SMA Policy for NASA Spacecraft, Instruments, and Launch Services*
- AFSPCMAN 91-710 – *Eastern and Western Range Safety Requirements*



# KSC Safety Activities

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## Activities can include:

- Safety data package review/approval for flight hardware, GSE, & processing activities
- Approval of hazardous procedures and audit of non-hazardous procedures
- Validation of customer implementation of procedural and operational controls
- Verification of facility walk-downs and training
- Support of Payload Safety Working Groups (PSWG), Design Reviews, Working Groups, Technical Interchange Meetings, etc.
- Support real-time resolution of safety issues during processing
- Review/Approval of safety variances



# Payload Processing at Commercial Facility

## LS Division Safety roles:

- SOW Requirements
  - NASA FAR Safety Requirements
  - Safety and Health Plan
  - Mishap Reporting
- Facility/Operational Safety Requirement Tailoring
  - Incorporate applicable Range Requirements, NASA Standards, User Requirements
- Certification of Facility Readiness (CoFR)
  - Document review, Audits, Facility Walkdown
  - Facility GSE and Safety Systems
- Ground Operations Review (GOR)
- Performance Evaluation
  - User Feedback
  - Surveillance



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# Safety Responsibilities at the PPF and Launch Site

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S/C Processing Facility



Launch Complex

## USAF Range Safety

Public Safety/Base Safety/Launch Site Safety

## NASA S/C Center & Contractor Safety & Mission Assurance

## Payload Processing Facility

Facility Resource Protection/Safety Control Authority

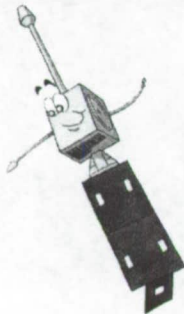
## NASA KSC Safety & Mission Assurance

KSC Resource Protection; LV – S/C Integration SMA; LV SMA

← LV – S/C Integration →

## Launch Vehicle Contractor

LV SMA; LV – S/C Integration SMA





# Compliance Documents

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## **Mission, Range, and Processing Location determine applicable requirements**

- NASA FAR supplement defines requirements for safety & health plan and mishap reporting
- OSHA defines personnel safety, Process Safety Management, etc.
- NASA-STD-8719.8 defines the safety review process for NASA ELV payloads; being replaced by NPR 8715.XX for ELV Payload Safety
- NASA and KSC requirements and standards (i.e. NPR 8715.3) define system design and operational requirements for NASA facilities and NASA designed hardware
- KNPR 8715.3 defines operational safety requirements for processing/operations on KSC facilities (VAFB SLC-2, KSC PHSF, etc..)
- AFSPCMAN 91-710 defines safety requirements for Eastern & Western range users
- MIL and industrial standards (e.g. ANSI, ASME, IEEE, ACGIH) may be contractually required



# Safety Requirements and Standards

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## NASA Safety Documents

- NASA-STD-8719.8, *Expendable Launch Vehicle Payload Safety Review Process Standard*
- NPR 8715.3, *NASA General Safety Program Requirements*
- NPR 8715.XX, *Expendable Launch Vehicle Payload Safety Program*
- NASA-STD-8719.9, *Standard for Lifting Devices and Equipment*
- NASA-STD-8719.13, *Software Safety Standard*
- NPR 8621.1, *NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping*
- NSS 1740.12, *Safety Standard For Explosives, Propellants, And Pyrotechnics* (Will soon be known as NASA-STD-8719.12)
- NPR 8715.6, *NASA Procedural Requirements for Limiting Orbital Debris*





# Safety Requirements and Standards

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## **KSC Safety Documents**

- KNPR 8715.3, *KSC Safety Practices – Procedural Requirements*
- KTI 5212, *Material Selection List for Plastic Films, Foams, and Adhesive Tapes*
- KNPR 1860.1, *KSC Ionizing Radiation Protection Program*
- KNPR 1860.2, *KSC Non-ionizing Radiation Protection Program*

## **Government**

- Title 29 CFR 1910, *Occupational Safety and Health Administration*
- Title 49 CFR, Parts 171 to 178, *Transportation, Department of Transportation*
- National Fire Codes (NFPA)

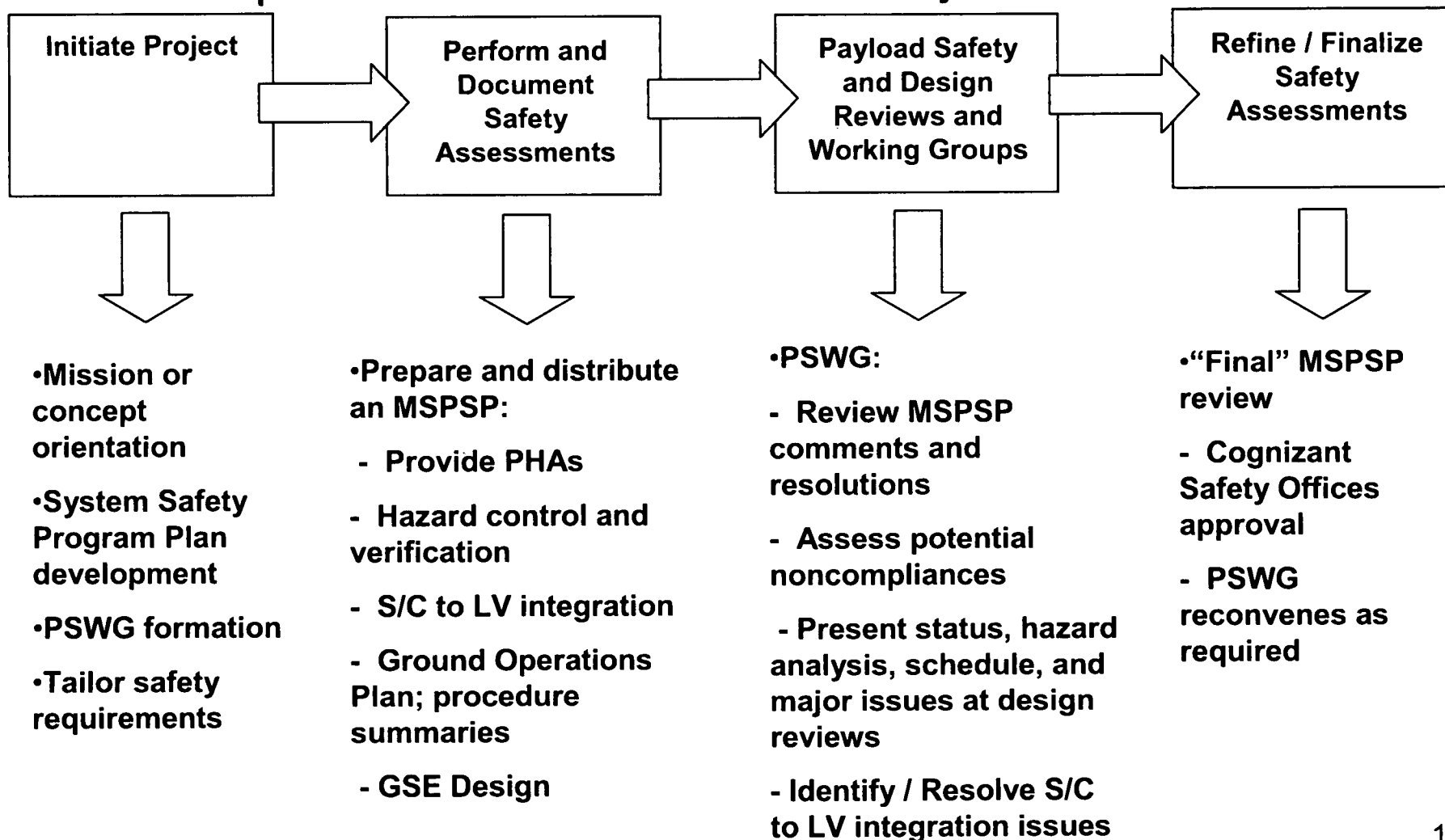


# NASA-STD-8719.8 Process Elements

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## Spacecraft / Launch Vehicle Interface Safety Review Process





# Safety Data Submittals

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**Missile Systems Prelaunch Safety Package (MSPSP)** – Comprehensive description of hazardous & safety critical flight hardware, systems, software, materials, hazard analysis and mitigations. Provides the means of verifying compliance to prelaunch safety requirements.

- Spacecraft MSPSP – Addresses bus, instruments, payload and hazards
- Launch Vehicle MSPSP – Identifies launch vehicle design and hazards
- Launch Vehicle Mission Unique MSPSP – Addendum to baseline vehicle MSPSP, addressing mission unique items and spacecraft interface. Spacecraft inputs are required

**Ground Operations Plan (GOP)** – Detailed description of planned operations, associated GSE and the associated hazard analysis. Includes listing of all non-hazardous and hazardous procedures.

**Procedures** – All tasks performed on the range require written procedures. Hazardous procedures are to be submitted 55 days prior to use date with final procedures published 10 days prior to use.

**Radiation Use Authorization/Request** – Provides description of ionizing and non-ionizing sources, identifies Area Radiation Officer and Users, experience and training. Forms submitted to KSC LSIM.



# Safety Data Requirements/Milestones

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## "Typical"

| Description                                  | Action By | Review       | Requirement                          | Submittal Requirements                       |
|----------------------------------------------|-----------|--------------|--------------------------------------|----------------------------------------------|
| Systems Safety Program Plan (SSPP)           | S/C       | PSWG         | NASA-STD-8719.8;<br>AFSPCMAN 91-710  | Draft presented at Mission/Concept Briefing  |
| Mission/Concept Briefing                     | S/C       | PSWG, et.al. | NASA-STD-8719.8;<br>AFSPCMAN 91-710  | Mission Kickoff, 45 days after project start |
| Requirements Tailoring                       | S/C       | PSWG         | NASA-STD-8719.8;<br>AFSPCMAN 91-710  | Prior to PDR                                 |
| S/C Draft/Initial MSPSP                      | S/C       | PSWG         | AFSPCMAN 91-710 ;<br>NASA-STD-8719.8 | PDR                                          |
| Preliminary Design Review (PDR)              | S/C       | PSWG         | NASA-STD-8719.8;<br>AFSPCMAN 91-710  |                                              |
| Payload Safety Working Group (PSWG) meetings | S/C       | PSWG         | NASA-STD-8719.8                      | PDR, CDR, GOWGs, and as requested            |
| S/C Preliminary MSPSP                        | S/C       | PSWG         | NASA-STD-8719.8                      | CDR                                          |
| Critical Design Review (CDR)                 | S/C       | PSWG         | NASA-STD-8719.8;<br>AFSPCMAN 91-710  |                                              |



# Safety Data Requirements/Milestones

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## "Typical"

| Description                   | Action By | Review          | Requirement                                  | Submittal Requirements                                |
|-------------------------------|-----------|-----------------|----------------------------------------------|-------------------------------------------------------|
| S/C Final MSPSP               | S/C       | PSWG            | NASA-STD-8719.8<br>AFSPCMAN 91-710           | 45 days prior to S/C arrival at processing site.      |
| S/C Final MSPSP Approval      | PSWG      | PSWG            | NASA-STD-8719.8;<br>AFSPCMAN 91-710          | Prior to S/C arrival at the processing or Launch Site |
| S/C Hazardous Procedures      | S/C       | KSC, RS         | KNPR 8715.3;<br>AFSPCMAN 91-710              | 55 Days prior to use                                  |
| S/C Waivers, Variances        | S/C       | PSWG            | NPR & KNPR 8715.3;<br>AFSPCMAN 91-710        |                                                       |
| LV Material Use Authorization | LV        | PSWG            | KNPR 8072.1; KNPR 8715.3;<br>AFSPCMAN 91-710 |                                                       |
| LV Mission-Unique MSPSP       | LV        | KSC, RS,<br>S/C | AFSPCMAN 91-710                              | NLT 45 days prior to Hardware Shipment to Range       |



# Safety Data Requirements/Milestones

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## "Typical"

| Description                                             | Action By       | Review    | Requirement                     | Submittal Requirements                          |
|---------------------------------------------------------|-----------------|-----------|---------------------------------|-------------------------------------------------|
| Radiation Use Authorization Request                     | S/C; LV         | RPO       | KNPR 1860.1;<br>AFSPCMAN 91-710 | 4 Months prior to SC arrival at processing site |
| LV Hazardous Procedures                                 | LV              | KSC, RS   | EWR 127-1 or<br>AFSPCMAN 91-710 | 55 Days prior to use                            |
| LV Waivers, Variances                                   | LV              | KSC, RS   | EWR 127-1 or<br>AFSPCMAN 91-710 |                                                 |
| Ground Operations Review (GOR)                          | KSC             | S/C, KSC  |                                 | 30 days prior to Hardware ship                  |
| Mishap Reports                                          | S/C; LV;<br>PPF |           | KNPR 8715.3;<br>NPR 8621.1B     | ASAP/within requirements                        |
| Safety & Mission Success Review (SMSR) (Formally SMARR) | KSC & S/C       | HQ Code Q | OSMA-SMARR-05-01                | L-30 days                                       |



# Payload Safety Working Group

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**The Payload Safety Working Group (as chartered by NASA-STD-8719.8), is the “Round Table” of ELV Payload Safety**

- **Provides a common and uniform ELV payload safety process**
- **All members have an equal say**
- **KSC Safety will act as PSWG Chairperson; the chair does not have an overriding veto**
- **Not as regimented as many safety panels**
  - **Informal atmosphere**
  - **All welcome to speak at any time about any relevant safety topic**



# Payload Safety Working Group

- **PSWG involvement includes:**
  - **Requirements tailoring**
  - **Approvals**
  - **Safety Plan Development**
  - **MSPSP Development**
  - **MSPSP reviews**
  - **Specialized safety working groups**
  - **General safety topics discussion**
  - **Safety action items**
- **Functions as both a panel and as a working group**
- **Working groups can be held at anytime at the request of any PSWG member by face-to-face meetings or telecons**





# KSC Safety

- **Things KSC Safety likes to see:**
  - **Plastic films, foams, and adhesive tapes (PFAs) to be used identified and submitted as soon as they are known**
  - **Hazard reports in MSPSP/ARAR**
    - **Timely submittal of verification tracking log (VTL) statuses**
  - **Safety analyses addressing KSC lessons learned**
  - **A Payload Organization safety representative at the launch site during S/C hazardous operations**
  - **Access to spacecraft propellant fill and drain valves through the payload fairing for contingency offloading**



# KSC Safety

- **Things KSC Safety Does Not like to see:**
  - **Safety variances stating schedule and/or cost as the only driving factor(s)**
  - **GSE, PFAs, test plans, etc. that show up at the launch site that were not approved through the PSWG (MSPSP) process**
  - **Launch site processing being performed before approvals**
  - **Non-safety personnel performing safety assessments**
  - ***“...but XYZ payload didn’t have to...”***
  - **The use of older safety requirements because of convenience**



# Contingency Planning

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- **NASA Launch Services Program (LSP) Mishap Preparedness and Contingency Plan (MPCP)**
  - Developed by Launch Services Division SMA for each mission.
  - Effective from Countdown Call-To-Stations through end of Launch vehicle mission.
  - Identifies specific immediate actions that NASA Launch Team personnel take in response to a launch mishap including:
    - Establishment of an Interim Response Team (IRT)
    - Mishap notification
    - Mishap Coordination with Launch Range
    - Coordination and release of public information
    - Mishap response teleconferences
    - Data impoundment at all locations where NASA and spacecraft personnel support launch operations
    - Witness statement collection





# Points of Contact

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## NASA/KSC Launch Services Division Safety Contacts

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